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POLLUTION SURVEY OF FLINT RIVER AND LAKE SEMINOLE IN THE VICINITY OF BAINBRIDGE, GEORGIA

Public Health Service
Atlanta, Georgia

October 1960

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POLLUTION SURVEY
of
Flint River and Lake Seminole
in the Vicinity of
Bainbridge, Georgia

Prepared for

U. S. Army

Corps of Engineers

Mobile District

Department of Health, Education, and Welfare
Public Health Service, Region IV
Water Supply and Pollution Control Program
Atlanta, Georgia
October 1960

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INTRODUCTION

At the request of the District Engineer, Mobile District, Corps of Engineers, a study of the pollution conditions in Jim Woodruff Reservoir (Flint River) in the Vicinity of Bainbridge, Georgia was undertaken. In accordance with the request and subsequent discussions between the Corps of Engineers and the Public Health Service, the survey was limited to a bacteriological investigation. As the purpose of the survey was to determine the immediate pollutional effect of the discharge of untreated sewage by the City of Bainbridge to the Flint River, a limited study of this type was appropriate.

The field survey was conducted by two engineers from the Region IV office of the Public Health Service and a chemist-bacteriologist from the Service's Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio. The survey was begun on October 10 and completed on October 21, 1960.

Flow data were provided by the Corps of Engineers' District Office in Mobile, Alabama.

SUMMARY AND CONCLUSIONS

1. Bacteriological data collected during a two-week field survey of Lake Seminole (Flint River)show the waters of the lake to be polluted in the vicinity of and 12 miles downstream from the City of Bainbridge.

2. The major source of this bacterial pollution was found to be the City of Bainbridge which discharges untreated sewage from a population of approximately 11,000 people directly to the watercourse.

3. During the period of low flow studied, visual signs of gross pollution were present in the vicinity of the 20" sewer outfall which carries most of the sewage from the City of Bainbridge and which discharges immediately above the Bainbridge municipal park.

4. High concentrations of coliform organisms (In excess of 4,900/100 ml expressed as the Most Probable Number) existed in Lake Seminole some 12 miles downstream from Bainbridge.

5. The bacteriological quality of the waters along the shore line of the city park was degraded to the point where recreational use of the waters for water contact sports, boating, and fishing is highly undesirable.

Merdian values for the MPN determinations made of samples collected along the shore line were considerably in excess of the 5,000/100 ml generally proposed as the upper limit for bacteriological quality for recreational use waters.

6. The construction and operation of the Jim Woodruff Lock and Dam has not affected the magnitude of the bacterial pollution problem in the vicinity of Bainbridge.

GENERAL DESCRIPTION

The Flint River rises in the Piedmont Plateau just south of Atlanta, Georgia and flows in a southerly direction to its confluence with the Chattahoochee River at the Georgia-Florida State line at Chattahoochee, Florida. These two rivers form the Apalachicola River which flows 112 miles from the state line to the Gulf of Mexico.

The total drainage area of the Flint River Basin lies wholly within the State of Georgia and covers approximately 8,300 square miles. At Bainbridge, Georgia, the drainage area of the river is 7,350 square miles. Major tributaries of the Flint River include Whitewater Creek, Potato Creek, Kinchafoonee River, Ichawaynochway Creek, and Spring Creek. Only Spring Creek enters the river below Bainbridge.

The Jim Woodruff Lock and Dam project was completed in 1957 by the U. S. Army Corps of Engineers. The impounded waters

of this dam are known as Lake Seminole and have a normal stage of elevation 77.0 feet above MSL. The two major arms of the lake are the Chattahoochee River and the Flint River.

The two principal purposes of the project are navigation and hydroelectric power generation. The reservoir is maintained at a relatively constant level to assure navigable depths to Columbia, Alabama on the Chattahoochee River and Bainbridge, Georgia on the Flint River. The power plant is operated as a run-of-the-river plant.

The 1950 census population of the City of Bainbridge was 10,000. The present population at Bainbridge according to preliminary 1960 census figures is 12,700 which includes an estimated 3,500 people residing in West Bainbridge, a recently annexed area across the Flint River from Bainbridge.

The city has developed a municipal park along the Lake Seminole waterfront and has provided facilities for boating, fishing, and picnicking. The Port of Bainbridge State Dock is located about two miles downstream from this municipal park. There is also a private boat landing adjacent to the State Dock.

There are several fishing camps and boat landings located along the lake downstream from Bainbridge. A municipal park developed by the City of Chattahoochee, Florida is located just upstream from the lock and dam.

OTHER SURVEYS

In 1947, the Georgia Department of Public Health made a stream survey of the Flint River in the Vicinity of Bainbridge. The survey covered the reach of the river from above the Bainbridge municipal sewage outfalls to about twenty miles downstream.

In 1948, the Florida State Board of Health conducted a comprehensive preimpoundment survey of the Flint River as well as the Chattahoochee and Apalachicola Rivers. This survey was made to determine the suitability of Apalachicola Bay waters for the production of oysters and other shellfish, to determine effects of pollution on the quality of such waters, and to determine the corrective action required to maintain a suitable water quality. It was in the recommendations of the report of this survey, that the State of Florida went on record as complaining of interstate pollution, naming sources of pollution, and listing damages caused by this pollution. Copies of this report were transmitted to the States of Georgia and Alabama and to the communities mentioned in the report.

In 1958, the U. S. Public Health Services at the request of the Corps of Engineers made a comprehensive pollution survey of the Flint River in the vicinity of Bainbridge. The purpose of this survey was to determine the water quality and sanitary conditions of the river and to compare the then present conditions

of the river with similar conditions existing prior to the construction of the Jim Woodruff Dam and impoundment of Lake Seminole. The conclusions reached as a result of this survey included the following:

1. The dissolved oxygen in the vicinity of Bainbridge was about the same under pre- and post-impoundment conditions and thus the impoundment of the Flint River had not created a dissolved oxygen problem.

2. The biochemical oxygen demand was about the same under pre- and post-impoundment conditions and thus impoundment conditions of the Flint River had not created a biochemical oxygen demand problem.

3. In the vicinity of Bainbridge, the impoundment had not created a bacterial pollution problem. Although the bacterial pollution was found to be higher at the time of the survey (1958) than it was in 1948, the increase was attributed to the growth of the sewered population. It was felt that the bacterial pollution in the vicinity of Bainbridge was no greater with the impoundment than it would have been with the free flowing river.

The Georgia State Health Department checks the bacteriological quality of the waters of Lake Seminole in and around the swimming and recreational areas located at Seminole Park and Chattahoochee Park. These checks are made by the State Health Department's regional office in Albany with the cooperation of

the Resident Engineer, Corps of Engineers of the Jim Woodruff Dam Project in Chattahoochee, Florida.

MAJOR SOURCES OF POLLUTION

1. Albany, Georgia - In May 1960, the City of Albany completed a 10 mgd primary sewage treatment plant. This plant was constructed with federal assistance as provided in the Federal Water Pollution Control Act (P. L. 660).

Recently the city has applied for another Federal Grant for construction of a series of interceptors and pumping stations which will eventually serve an additional population of 24,500 people. Sewage will be carried by these interceptors to the new treatment plant.

Albany has experienced a rapid rate of growth. Preliminary 1960 census figures show the population of Albany to be 55,136 - a 77 percent increase over the 1950 population. Of this total, 35,750 are served by a combined sewer system and primary treatment plant. The treatment plant is designed for an organic loading of 125,000 P.E. and at the present it is estimated that 89,000 P.E. are received at the plant. The P.E. of the plant effluent is estimated to be 58,000.

2. Bainbridge, Georgia - The City of Bainbridge discharges its municipal wastes directly to the Flint River without treatment. The preliminary 1960 census show the population of Bainbridge to be 12,694 - a 27 percent increase over the 1950

population. It is estimated that approximately 85 percent of the city is sewered and that the major portion of the sewage is discharged to the river via a 20" sewer outfall which is located just above the city park. There are two other sewer outfalls - an 8" and 10" - which serve small outlying areas and which discharge several hundred yards below the 20" outfall.

3. West Bainbridge, an unincorporated area, lying across the river from Bainbridge has an estimated population of 3,500 and several industries including a peanut shelling plant, a cardboard box factory, and a livestock feed and fertilizer mill. This area is presently unsewered, its population being served by individual septic tanks. Observations made during the field survey indicated that no major sources of organic pollution of Lake Seminole originated from this area.

4. Southern Airways School above Bainbridge - This installation was being vacated during October 1960 and it was planned to close it down by January 1, 1961. Information was not available as to any future plans concerning the use of the school buildings and facilities.

SURVEY METHODS

The field survey was begun on October 10 and continued through October 21, 1960. No samples were collected on Saturday and Sunday, October 15 and 16. One sample run per day was made beginning in the morning. On Monday and Thursday of the second

sampling week (October 17 and October 20) two samples were collected from each station; one in the morning and one in the afternoon.

Samples were collected and analyzed in accordance with the procedures established in the Tenth Edition of Standard Methods for the Examination of Water, Sewage and Industrial Wastes published by the American Public Health Association. The multitude fermentation technique was used in determining the coliform density of the samples collected.

LOCATION OF SAMPLING STATIONS

Sampling stations were selected to coincide with those used in the 1958 Public Health Service survey and are shown in Figure 1. Twelve stations were established, nine of which were in the main run of the river. The other three stations were located along the east bank of the lake at and below the 20" sewage outfall and in the vicinity of the municipal park area. These latter stations were selected to determine the effect of the discharge of untreated sewage upon the quality of the water in the immediate vicinity of the Bainbridge City Park. Table 1 gives the descriptions of all sampling stations used in the survey.

CORPS OF ENGINEERS

U.S. ARMY

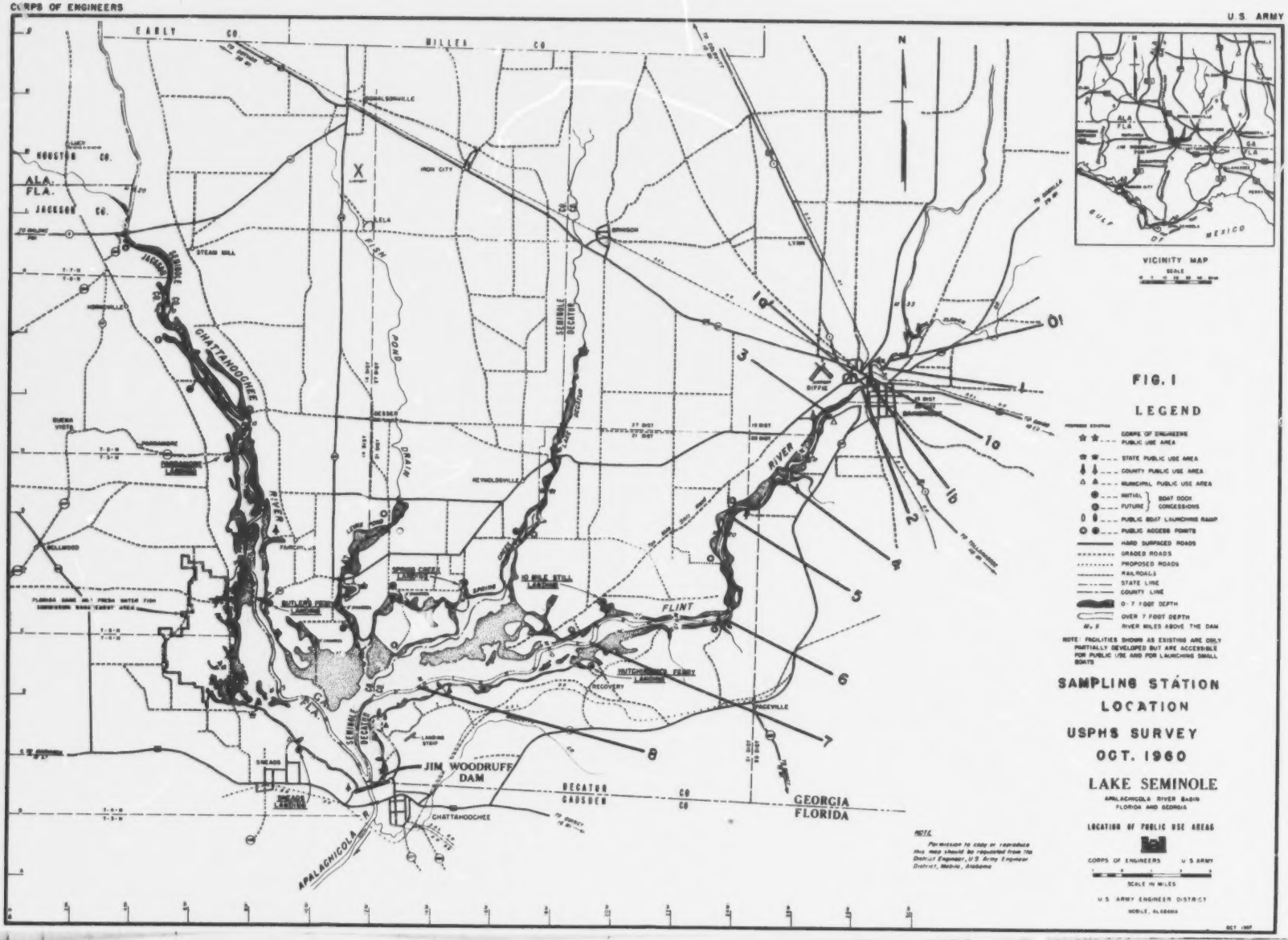
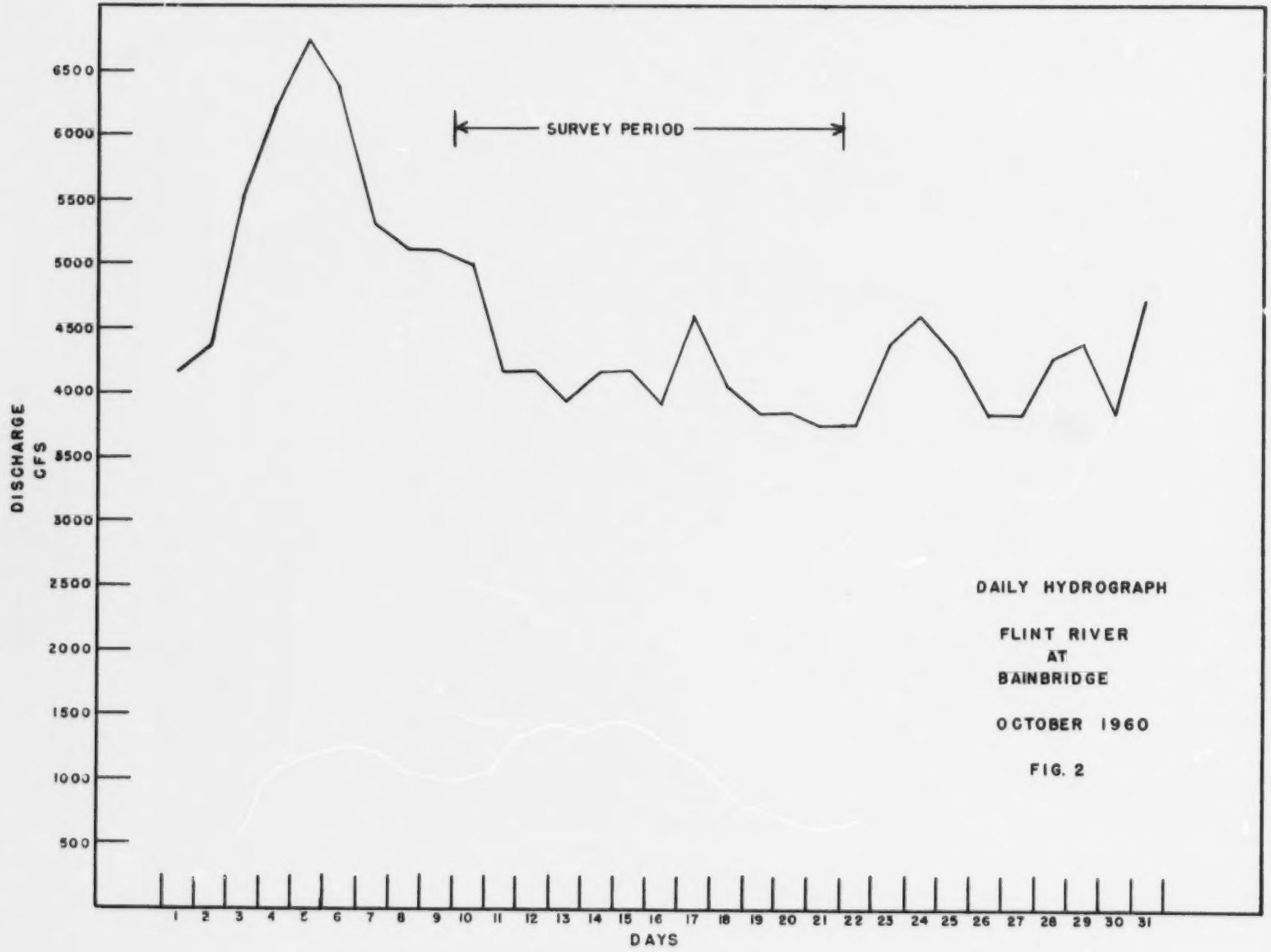


TABLE 1
SAMPLING STATION LOCATIONS

Station No.	River Mile	Description
01	30.25	Above Bainbridge dump at Transmission Line.
1	29.25	Atlantic Coast Line Bridge.
1a	28.75	In pool of Bainbridge 20 inch outfall.
1a'	28.65	Thirty yards off Concession Stand in Bainbridge City Park.
1b	28.50	Twenty yards off Bainbridge City Boat Ramp.
2	28.0	First bend below SALRR Bridge.
3	26.5	Georgia State Dock.
4	23.5	Buoy 199-200 (Four Mile Creek).
5	20.75	Buoy 175-176 (Hales Landing).
6	16.75	Buoy 133-134 (Faceville Landing).
7	11.5	Buoy 89-90 (Johnson Landing).
8	5.0	Buoy 41-42 (Quincy-Gadsen Park).


SURVEY PERIOD
DISCHARGE CFS
6500
6000
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
DAYS
DAILY HYDROGRAPH
FLINT RIVER
AT
BAINBRIDGE
OCTOBER 1960
FIG. 2

SURVEY RESULTS

Laboratory results of the bacteriological tests are summarized in Table 2. Median, maximum, and minimum MPN values are listed for each station.

All samples were collected in the main run of the river except those collected at stations 1a, 1a', and 1b. These latter stations were located along the east bank of the lake, just below the 20" sewage outfall and in the immediate vicinity of the Bainbridge city park.

Flow during the sampling period remained fairly constant fluctuating from a maximum of 4,980 cfs to a minimum of 3,720 cfs and averaging 4,120 cfs. Figure 2 is the daily hydrograph for the Flint River at Bainbridge for the month of October 1960. From the hydrograph, it can be seen that the survey was conducted during a low flow period with little indication of flush outs due to excessive flows. Thus, coliform results obtained are primarily from the discharge of sewage and other wastes into the river.

During the survey, observation of the pool of the 20" outfall showed visible signs of gross pollution. Scum, floating material, and general unsanitary conditions were noted from the point of discharge of the sewer to a point about 100 yards downstream opposite the concession stand of the city park.

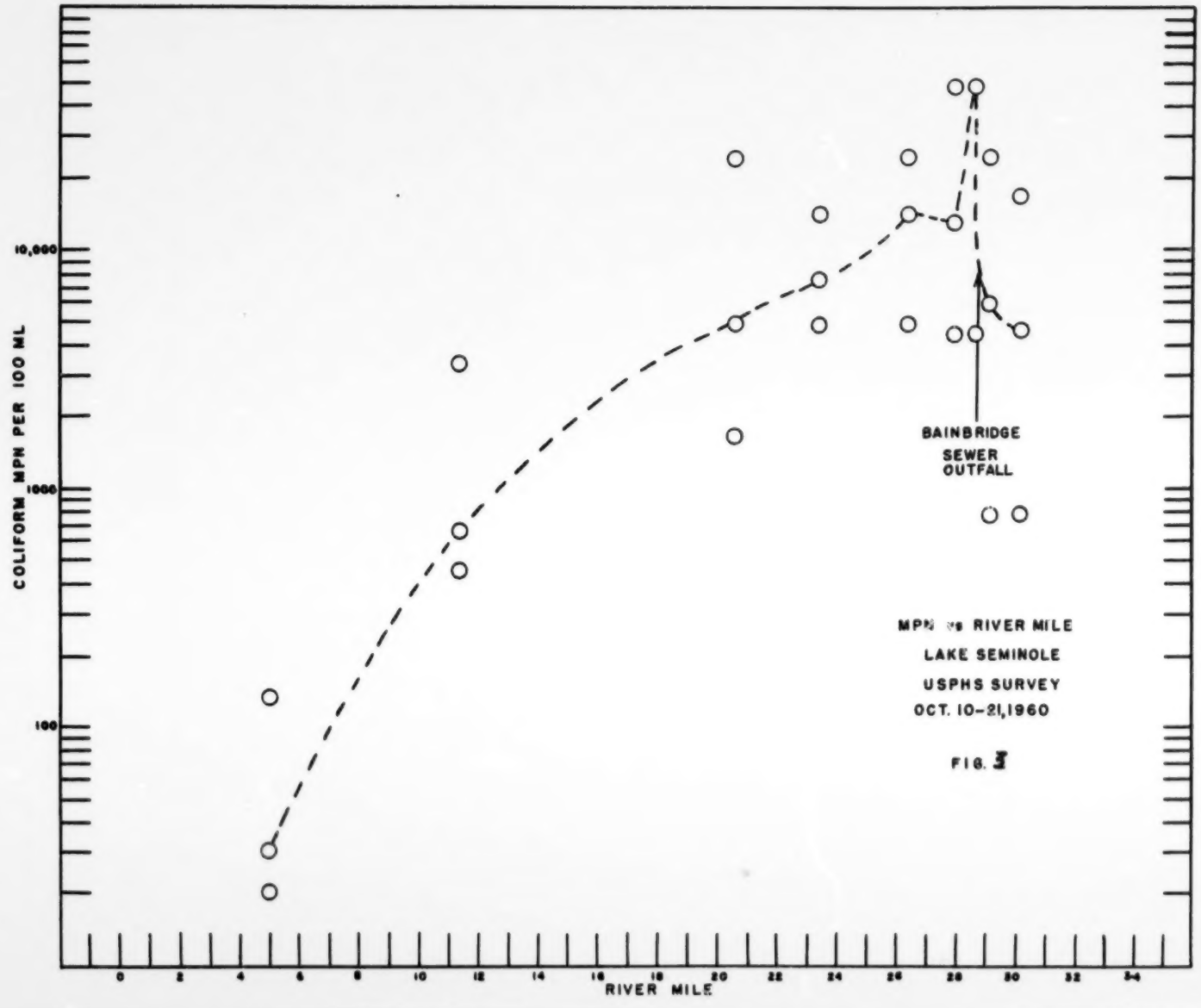
TABLE 2
BACTERIOLOGICAL DATA
MOST PROBABLE NUMBER
OF COLIFORM PER 100 ML

MAIN STEM

Station No.	River Mile	Coliform per 100 ml Median	Maximum	Minimum
01	30.25	4,600	17,000	790
1	29.25	5,920	24,000	790
2	28.0	49,000	350,000	4,500
3	26.5	12,000	49,000	4,500
4	23.5	13,000	24,000	4,900
5	20.75	7,450	13,000	4,900
6	16.75	4,900	24,000	1,700
7	11.5	640	3,300	460
8	5.0	20	130	10

EAST RIVER BANK

1a	28.75	15,450,000	35,000,000	790,000
1a'	28.65	17,000	540,000	2,000
1b	28.50	41,000	130,000	13,000



MPN vs RIVER MILE
LAKE SEMINOLE
USPHS SURVEY
OCT. 10-21, 1960

FIG. 3

DISCUSSION OF RESULTS

Figure 3 is a graphical presentation of the bacteriological data showing the maximum, median, and minimum concentration of the most probable number of coliform per 100 milliliters versus river mile. Only the results of the stations sampled in the main stem of the river are shown on this figure. From this plot, the effect of the discharge of untreated sewage at Bainbridge can be readily seen. The coliform concentration rose rapidly just below the point of sewage discharge and then diminished gradually for the remainder of the reach under study. This reduction of coliform organisms is typical and illustrates the die-off pattern of these organisms in a stream or body of water.

The high concentrations of coliform found below Station 1 were attributed to the discharge of untreated sewage by the City of Bainbridge via a 20" sewer. The increase in median concentration from 5,920 per 100 milliliters at Station 1 to 49,000 per 100 milliliters at Station 2 clearly indicates the fact that the City of Bainbridge is now polluting the waters of Lake Seminole. Although the median coliform count diminishes downstream, they still remain high (almost 5,000/100 ml) 12 miles downstream at Station 6. The high reduction of coliform between Station 6 and 8 is attributed to both the die-off phenomena and to the fact that Spring Creek enters the river at Station 8 providing dilution for the wastes. The low concentration of coliform organisms

at this last station indicated that the lake had completely recovered from the bacterial pollution load discharged by Bainbridge some 23 miles upstream.

Results at Station 1a, 1a', and 1b show the bacteriological quality of the water along the shore line of the city park. Although the concentrations of coliform reduced rapidly, they were still of sufficiently high magnitude to make these waters unacceptable for all water contact uses. The median concentration of coliform at these three stations varied from 17,000/100 ml to 15,450,000/100 ml.

In many areas of the country, waters having a coliform concentration of greater than 5,000/100 ml expressed as the Most Probable Number are considered unfit for water contact uses, and boating and fishing. The bacteriological quality of the waters along the shore line of the Bainbridge municipal park far exceed this limit. Inasmuch as these waters are used for boating and fishing and abut picnicking and restaurant facilities, this situation is most undesirable.

Several dissolved oxygen determinations were made during the course of the field survey. Although the number of samples analyzed were too few to give an accurate dissolved oxygen profile, they did show that low dissolved oxygen is not a problem in the reservoir. At no time did the dissolved oxygen fall below 70 percent of saturation and the results averaged about 80 percent of saturation.